CONTENTS

Foreword by Vice-Dean (Research) 1
Research Directions 2
Research Highlights 3

- Elastic Properties of Polymer-based Dental Restorative Materials - A Micro-indentation Approach
- Maintenance of Odontoblasts and Pulp Fibroblasts in Incisor Slice Culture for Pulp-cytotoxicity Testing of Dental Materials
- Building a Virtual Head

Research Activity Highlights 7

- Faculty Research Retreat
- Faculty Research Day
- International Association for Dental Research 2003, Goteborg (Sweden)

Patents / Research Awards 11
Editorial Appointments 11
Research Collaborations AY 2002 - 2003 12
Research Grants FY 2002 - 2003 13
Refereed Publications Calendar Year 2002 15
Conference Papers AY 2002 - 2003 17
Graduate Students Research Projects AY 2002 - 2003 22

- Graduate Residents in MDS Programmes
- PhD and MSc Candidates
Oral health is integral and essential to general health. The Faculty of Dentistry plays a leading role to maintain optimal oral health by spearheading quality and innovative research to prevent debilitating oral diseases and improve the delivery of dental care. This year, the pace of research at the Faculty of Dentistry continues to gather momentum to seek fresh answers to age-old dental and craniofacial health problems.

Building a strong foundation in oral health research is crucial to a thriving research culture in the Faculty. The mentoring process is in place with senior Faculty members shouldering the task of taking junior staff and research students under their wings and guiding them through the process of research. While inadequate infrastructure and resources are the constant limiting factors for many in research, the Faculty is privileged to be given a substantive amount of research laboratory space of about 425sqm (half a floor at the third level) at the upcoming Defence Medical Research Institute (DMRI) building on NUS campus. When the research arm of the Faculty moves into this new laboratory space in July 2004, a significant milestone in the history of the Faculty will be crossed as this will represent a home for dental researchers to build their foundation and push new frontiers in oral health research.

Funding for Faculty research has been unprecedented. Two large grants from the Biomedical Research Council (BMRC) and the Ministry of Education's Academic Research Council (ARC), amounting to more than S$1.4 million, were recently approved and together with funding from National University of Singapore (NUS), National Medical Research Council (NMRC) and National Healthcare Group (NHG), the Faculty of Dentistry received in excess of $2.2 million of research funding for the period July 2002 till September 2003.

In the Faculty's quest to create a thriving research culture, there is an ever greater need to establish a worthy cause for conducting research which motivates and challenges each researcher in the Faculty to examine critical issues in oral health research and be leaders in knowledge discovery. The practical reality will not be easy, but neither are most worthy causes. Let me end with a quote from the former US President Theodore Roosevelt:

"The credit belongs... to the man who is actually in the arena, who strives valiantly; ...who knows the great enthusiasms, the great devotions, and spends himself in a worthy cause, who at the best, knows the triumph of high achievement; who, at the worst, if he fails, ...at least fails while daring greatly, so that his soul shall never be with those cold and timid souls, who neither know victory nor defeat".

Let us take up the challenge to strive valiantly in the worthy cause of oral health research; out of it will flow enthusiasms and devotions that will lead to knowledge discovery.

Assoc Prof Kelvin Foong
Vice-Dean (Research)
The Faculty of Dentistry has three focus groups in research - Calcified and Connective Tissues, Biomaterials and Oral Health Services. The categorisation of research topics into these three groups serves to focus the Faculty's research to address prevalent oral diseases/disorders and issues affecting the well being of individuals. Under the coordination of a research focus group leader, research activities within each research area are driven by principal investigators, and supported by teams of bright research students and experienced collaborators from NUS and external institutions.

There are currently FIVE key research areas in the Faculty of Dentistry which aim to improve oral and craniofacial health and the delivery of care.

**Current Key Research Areas in the Faculty of Dentistry**

- Tissue Engineering and Regenerative Biology
- Mechanisms of Oro-Facial Pain
- Biophotonics with Emphasis on Cariology Research
- Biomaterials and Biomechanics
- Craniofacial Imaging and Simulation

To Improve Oral and Craniofacial Health, and Delivery of Care
Elastic modulus is one key mechanical property which affects the clinical performance of dental filling materials. During mastication, restorative materials are subjected to high cyclic biting forces and must therefore possess adequate stiffness to prevent deformation and bulk/marginal fracture. When used to restore cervical cavities, a low modulus is desired to allow materials to flex together with teeth. The 2D finite-element model in Fig. 1 illustrates the different stress-field developed in the dental hard tissues when an axial compressive force is applied on filling materials with varying elastic modulus from 16.6 GPa (close to that of composite resin and amalgam) to 206 GPa (steel). As evident in Fig. 1(d), filling materials with ultra high modulus as compared to those of enamel and dentin is not desirable, as it tends to crack the enamel under high load. On the other hand, materials with low modulus do not permit efficient stress diffusion and may deform under loading.

With escalating esthetic demands, the use of composite resins has increased tremendously in the last two decades. The current worldwide screening criteria for composite restoratives are documented in ISO 4049 Dentistry - Resin-based filling materials (ISO, 2000). In ISO 4049, the modulus (flexural) was determined using the three-point bending test method. It involves the use of large beam specimens (25x2x2mm), which are clinically irrelevant and very susceptible to preparation flaws. The objective of the current research is to develop depth-sensing micro-indentation methodology that can yield accurate mechanical properties based on appropriate size-scale dental composite specimens. This method involves the continuous tracking of applied load and indenter displacement using the instrumentation set-up as shown in Fig. 2. From the load-displacement (P-h) curve obtained, the elastic modulus of the materials can be deduced from the unloading curve with using the contact stiffness analysis. The technique relies on the fact that the materials undergo elastic recovery when the indenter is withdrawn from the indented material. The specimens used in the micro-indentation test are only 3x3x2mm. In an experimental investigation, a significant, positive and strong correlation \( r = 0.94 \) in modulus between ISO three-point bending and micro-indentation test methods was observed. This further supports the proposition that the micro-indentation test method is a potential test method for screening of resin-based dental restorative materials in addition to the ISO 4049:2000.
Good and reliable in vitro cytotoxicity testing techniques are required to determine any adverse cytopathic effects caused by dental materials. To perform cytotoxicity tests, a set of standard protocols are required and this has led to the establishment of ISO 10993-5, an international standard for biological evaluation of medical devices. The latter recommends the use of L929 cell line, an immortalised fibroblastic line of murine lung. Though recommended for general usage, relevant cell types of dental origin in natural organ-type environment would be more applicable to the clinical situation. Dental pulp cells consisting of a peripheral layer of odontoblasts and a central mass of fibroblasts (Fig. 1) are the most appropriate test cells for cytotoxicity. This project enables the deployment of these two cells for cytotoxicity testing, maintained in their true organ-type. In our study, the incisor slices were cultured (with or without agar gel embedding) and partially submerged in media. Partial submersion improved gas-exchange from the environment to the tissues. It was noted that the tissues were not dehydrated as envelop of liquid remained present around the incisor slice. The aims
of this study were to assess the viability of odontoblasts and pulp fibroblasts within the incisor slices in culture. The designed models were subsequently used for cytotoxicity testing of dental materials. The results indicate that the use of rodent incisor culture for maintenance of odontoblasts and pulp fibroblasts for testing of toxicity of dental materials was sensitive and consistent with current ISO10993-5 recommended cytotoxicity testing of dental materials. Fig. 2 shows the data on the maintenance of vital cells throughout the culture durations for two organ culture models of 'Without Agar' and 'With Agar'. For the first model, intact cell numbers were maintained up to Day 7 in culture. The second culture model allowed maintenance of pulpal cells up to Day 14. Fig. 3 and Fig. 4 show the cytotoxicity data of Tetric Ceram composite cured by different light units.

**Research Highlights**

**Maintenance of Odontoblasts and Pulp Fibroblasts in Incisor Slice Culture for Pulp-Cytotoxicity Testing of Dental Materials**

**Fig. 1:** Odontoblasts and pulp fibroblasts in 12 day agar-culture of rat incisor slice, HE stain

**Fig. 2:** Average of intact living cell from odontoblasts and pulp fibroblasts over different culture durations, using 'Without Agar' model and 'With Agar' model, comparing Day 0 control. Arrows indicate values were significantly different from Day 0 control (P<0.05)

**Composite cytotoxicity in direct model**

**Composite cytotoxicity in indirect model**

**Dental pulp cells consisting of a peripheral layer of odontoblasts and a central mass of fibroblasts are the most appropriate test cells for cytotoxicity.**

**Fig. 3:** Cytotoxicity of test composites to the dental pulp cells in direct contact model. Arrows indicate values were significantly different from control (P<0.05)

**Fig. 4:** Cytotoxicity of test composites to the dental pulp cells in indirect contact model. Arrows indicate values were significantly different from control (P<0.05)
Research Highlights

Building a Virtual Head
Assoc Prof Kelvin Foong, Assoc Prof Ong Sim Heng, Assoc Prof Ashraf Kassim, Assoc Prof Keng Siong Beng

Essentially, the aim of research would be to create an accurate, patient-specific virtual "double" so that morphometry, treatment planning and simulation may be carried out in clinical management.

The human head is the primary anatomy in which dental students and dental surgeons focus their learning and ply their skills. It is an organised matrix of hard and soft tissues enclosing the nasal and oro-pharyngeal airway. Dental and craniofacial clinicians often take imaging records to obtain static and dynamic dimensional, positional, relational information as well as information on the colour and texture of the relevant anatomy for arriving at diagnoses and to facilitate treatment. From the images obtained through various 2D and 3D imaging modalities, a patchwork of the craniofacial anatomy is created which could not provide a comprehensive representation of the entire complex. The thrust in craniofacial imaging research would therefore be to develop computer models that would accurately portray "anatomic truth" and enable the clinician to view the three-dimensional anatomy in both static and function as it exist in nature (Harell et al., 2002). Essentially, the aim of research would be to create an accurate, patient-specific virtual "double" so that morphometry, treatment planning and simulation may be carried out in clinical management (Fig. 1). However, the need for and the accuracy of visualisation models is very much dependent on the complexity of clinical work. Multiple, complex, inter-disciplinary procedures such as bimaxillary orthognathic surgery with implant placements require computer visualisation models more than single, simple uni-disciplinary procedures such as restoring a decayed tooth.

The Faculty of Dentistry, together with local partners at NUH and the Faculty of Engineering and international collaborators have leveraged on advances in imaging technology to construct virtual patient-specific "doubles". The imaging research work utilise 3D images acquired from multi-slice Computed Tomography (CT), micro CT (Fig. 2), surface laser scanning (Fig. 3) and ambient light scanning (Fig. 4) to obtain 3D skeletal, dental (Fig. 5) and facial models (Fig. 6). The work on developing accurate static and dynamic facial soft tissue modeling has started. While it is the most difficult component in the quest for a virtual facial double, current and future collaborations in the area of dynamic soft tissue modeling are likely to yield good results.
Research Activity Highlights

Faculty Research Retreat

Academic staff of the Faculty of Dentistry gathered on 17th October 2002 for a Research Retreat to examine the current status and explore future research directions in the Faculty. The timely Retreat was held at the Guild Hall, Kent Ridge Guild House with two objectives of (i) setting directions and refocus Faculty research areas for the next five years; and (ii) establishing strategies and plans to improve research activity and performance.

The current grouping of the Faculty's research projects under three focus groups of Calcified and Connective Tissue, Biomaterials and Oral Health Services has given the Faculty a strong sense of research direction. As a serious participant in the Life Sciences challenge, the Faculty of Dentistry will continue to strengthen current main research areas and develop niche research initiatives that aim to address key oral and craniofacial health problems. Research areas in the prevention of prevalent tooth decay and destructive periodontal disease, rehabilitation of the oral and craniofacial structures through innovative biomaterials and tissue-engineering, management of chronic facial pain as well as craniofacial imaging will spearhead the Faculty's research push that would lead to better strategies for prevention and delivery of care.

To build and sustain a vibrant research culture, the Faculty of Dentistry recognises the importance of research training, mentoring and an optimal working environment in developing a broad base of enthusiastic and clear-thinking researchers. The need for the Faculty of Dentistry to forge viable collaborations with leading research partners is imperative to leverage the strengths for research excellence as the world becomes a more globalised place.

Clearly, the challenges and opportunities in oral and craniofacial research are plenty and the NUS Faculty of Dentistry is ready and poised for a successful engagement.

The current grouping of the Faculty's research projects under three focus groups of Calcified and Connective Tissue, Biomaterials and Oral Health Services has given the Faculty a strong sense of research direction.
Research Activity Highlights

Faculty Research Day

Under the guidance of experienced staff mentors, students experience the joy of scientific discovery amidst the often hard work and grind of carrying out research.

It is the highlight of many months of hard work for groups of dental students who started their research projects in the final term of the second year. Under the guidance of experienced staff mentors, students experience the joy of scientific discovery amidst the often hard work and grind of carrying out research. In the 18 months of their projects carried out under the Undergraduate Research Opportunities Programme (UROP), dental students learn to explore fresh perspectives of a dental health problem and in the process they also learn to think critically and evaluate observations objectively.

The art of giving succinct presentations and supported with cogent answers are also part of the learning experience. At the Research Day presentations, student representatives from each research group of 4-5 students give a 2-minute oral presentation followed by a further 3 minutes of discussion with a panel of judges made up of senior staff. Prior to the oral presentations, the student group submits a research report in a format similar to a research thesis. Writing the thesis is in itself a great learning experience as it trains the students to think and write scientifically.

The top team at the Research Day represents the Faculty of Dentistry at the next year’s Student Clinician Programme during the International Association for Dental Research (South-East Asian Division) meeting which is a competition among the top dental school teams from South-East Asia. The 2nd and 3rd teams will represent the Faculty at the next year’s Asia Pacific Dental Students Association session which is a conference held for and by dental students in the Asia-Pacific Region.

The student team members and their project titles are:

**Dental Undergraduate Projects (Academic Year 2002-2003)**

**Undergraduate Research Opportunities Programme (UROP)**

**Effects of Surface Treatment and Aging on the Bond Strength of Orthodontic Brackets to Provisional Materials**

Chia Aileen (Ms)
Lim Yow Long
Norhisham Bin Mohamed
Wong Sue Lin (Ms)

*Supervised by Dr Chay Siew Han Assoc Prof Adrian Yap*

**Effect of Photodynamic Antimicrobial Chemotherapy on Enterococci**

Poh Hze-Khoong, Eugene
Tan Teck Siang, Gerald
Teo Bo Tong, Noah
Wong Wei Pang, Clement
Yeo Wei Yan

*Supervised by Dr Sum Chee Peng*

**The Radicular Penetration of Hydrogen Peroxide and External pH Changes Associated with Intracoronal Bleaching Agents**

Lee Ping, Geraldine (Ms)
Lim Ming Yee (Ms)
Lum Ooi Ying (Ms)
Poh Seng Chuan, Raymond

*Supervised by Dr Lim Kian Chong*

**Surface Treatment and Cement Maturation on Dentin Shear Bond Strength of a Resin Modified Glass Ionomer Cement**

Chin Choon Tsze, Kenji
Goh Choon Guan, Daniel
Goh Teck Suai
Tan Choon Siong, Aaron

*Supervised by Assoc Prof Adrian Yap Mr Chung Sew Meng*
Research Activity Highlights

Faculty Research Day

Evaluation of Surface Finishing and Polishing Techniques on Provisional Materials

Ang Chee Wan
Diong Hai Jie
Lee Tze Hong
Wee Tze Haur

Supervised by
Dr Loh Poey Ling
Assoc Prof Adrian Yap

Effect of Bleaching on Surface Roughness of Composite Restorative Materials

Chooi Kar Wei (Ms)
Lee Mei Fem, Lynette Ann (Ms)
Ryan Shannon Selamat
Zhou Ruiyi, Dahlia (Ms)

Supervised by
Dr Pranee Watanapayungkul
Assoc Prof Adrian Yap

The Sonic Hedgehog Network in Odontogenic Pathology - An Immunohistochemical Study

Boey Pui Yunn (Ms)
Lim Siow Hooi (Ms)
Rashmi Yash Paul (Ms)
Maung Kaung Myat Win

Supervised by
Dr Winston Tan

Effects of Commercially Available Mouthrinses on Hardness and Wear of Composite and Polyacid-modified Composite Restoratives

Chang Kok Meng
Loy Tsu Ken
Tan Wei Yang, Bernard
Tay Li Chye

Supervised by
Dr Betty Mok
Assoc Prof Adrian Yap

1st National Healthcare Group (NHG) Annual Scientific Congress

The inaugural National Healthcare Group Congress was launched on 17th - 18th August 2002 at the Grand Copthorne Waterfront Hotel.

The symposia devoted to Dentistry saw three Faculty members speak on the recent advances of their expertise domain. They are:

• Assoc Prof Grace Ong on "The Emerging Connection Between Oral Infection and Systemic Disease";
• Prof Chew Chong Lin on "Recent Advances in Restorative Dentistry"; and
• Dr Cao Tong on "Advances in Oral Tissues Research - Its Significance to the Practising Dentist"

The Faculty sent in a total of 20 research abstracts for competition. Dr Varawan Sae-Lim's research student, Ms Chou Ai Mei won "Poster of Distinction - Dentistry Section" and "Best Poster Award - Junior Doctors and Researchers Category" for her poster entitled "Preliminary Studies on Human Periodontal Ligament Fibroblasts and Alveolar Osteoblasts Cultured on Foil-scaffold Constructs".

The 6th NUS-NUH Annual Scientific Meeting

The 6th NUS-NUH Annual Scientific Meeting held on 16th - 17th August 2002 saw prominent speakers touching on a slew of hot life sciences topics ranging from cancer, genomics to tissue engineering.

Professor Bjorn R Olsen, from the Harvard School of Dental Medicine presented a Dentistry related topic on "Hemanangiomas and Vascular Anomalies - Molecular and Cellular Mechanisms". Faculty of Dentistry contributed 14 abstracts towards a total of 202 submissions.

Once again, Dr Varawan Sae-Lim's PhD student, Ms Chou Ai Mei clinched the "Best Clinical Science Paper" for her poster entitled "Preliminary Studies on Human Periodontal Ligament Fibroblasts and Alveolar Osteoblasts Cultured on Foil-scaffold Constructs".
The 81st General Session of the International Association for Dental Research (IADR) was held from June 25th - 28th, 2003 in Goteborg, Sweden with a total registration of 4,280 participants from 65 countries. Thirteen abstracts from Singapore were accepted this year. The number of accepted abstracts have increased steadily which indicates an active and quality research culture in the Faculty.

Activities apart from the main oral and poster presentation included hands-on workshops, group-sponsored and satellite symposia, plenary sessions, lunch and learning sessions and presentation of many awards and staff recognition. The IADR meetings not only gave us opportunities to present our work but also to learn and share knowledge, exchange ideas, seek collaborations and open our minds to new knowledge.

The IADR meetings not only gave us opportunities to present our work but also to learn and share knowledge, exchange ideas, seek collaborations and open our minds to new knowledge.
Patents / Research Awards

Awards

• **Ms Chou Ai Mei**, a PhD candidate co-supervised by **Dr Varawan Sae-Lim**
  Her poster “Preliminary Studies on Human Periodontal Ligament Fibroblasts and Alveolar Osteoblasts Cultured on Foil-scaffold Constructs” won Best Clinical Science Paper at the 6th NUS-NUH Annual Scientific Meeting, August 2002, Singapore, as well as the Poster of Distinction - Dentistry Section and Best Poster Award - Junior Doctors and Researchers Category at the 1st NHG Annual Scientific Congress, August 2002, Singapore.

• **Assoc Prof Kelvin Foong, Dr Arthur Lim, Dr Ling Chem Chem, Dr George Yip and Assoc Prof Bay Boon Huat**
  Won the Craniofacial Biology (IADR 1995 Prize) Research Award for the research project “Expression of Nitric Oxide Synthase in Palatal Wound Healing” at the 17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, September 2002, Hong Kong.

• **Dr Varawan Sae-Lim**
  Won the Oral Maxillofacial Surgery, Oral Pathology and Oral Medicine Research Award for the research project "The Effect of Intracanal Leader - Mix on Root Resorption of Delayed-replanted Monkeys’ Teeth" at the 17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, September 2002, Hong Kong.

• **Dr Arthur Lim**
  Won a poster prize for his poster “VEGF Expression Following Palatal Wound Healing in a Rabbit Model After Simulated Cleft Palate Surgery” at the National Dental Centre Annual Scientific Meeting, November 2002, Singapore.

• **Dr Juliet Tay**
  Won a poster prize for her poster "The Role of RANKL in Bone-resorbing Cysts and Tumours in the Facial Skeleton" at the National Dental Centre Annual Scientific Meeting, November 2002, Singapore.

• **Dr Tan Ban Fui**
  Awarded the International Association for Dental Research (South-East Asian Division) Charles T. Kean Memorial Award for her research project “A Critical Bending Moment of Implant Component Screw Joint Interface” for sponsorship of travel to the 17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, September 2002, Hong Kong.

• **Ms Saw Tzuen Yih, Dr Cao Tong, Dr Liu Hua, Assoc Prof Adrian Yap, Assoc Prof Ng Mah Lee**
  Won the Pulp Biology Group Award for the research project “Maintenance of Odontoblasts and Pulp Fibroblasts in Incisor Slice Culture for Pulp-cytotoxicity Testing of Dental Materials” at the International Association for Dental Research 81st General Session and 2nd Meeting of the Pan European Federation, June 2003, Goteborg, Sweden.

• **Ms Renuga Gopal**, a member of the joint research team of the Faculty of Dentistry and Faculty of Engineering led by **Prof Chew Chong Lin**
  Won the Merit prize (Open Section) of the Tan Kah Kee Young Inventors’ Award 2002, Singapore for the research project “Fibre-reinforced Composite Product with Flexible Longitudinal Geometry”.

• **Assoc Prof Adrian Yap, Dr Philip Cheang Hong Ning and Dr Gu Yanwei**
  Filed a US Provisional patent on “Fibre-reinforced Composite Product with Flexible Longitudinal Geometry”.

• **Assoc Prof Adrian Yap**
  Awarded the International Association for Dental Research (South-East Asian Division) Charles T. Kean Memorial Award for her research project "A Critical Bending Moment of Implant Component Screw Joint Interface" for sponsorship of travel to the 17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, September 2002, Hong Kong.

Patents Filed in 2002

• **Prof Chew Chong Lin** and his research team (Assoc Prof Kelvin Foong, Dr Loh Poey Ling, Assoc Prof Seeram Ramakrishna, Ms Renuga Gopal, Dr Ganesh and Dr Fujihara Kazutoshi) filed a US Provisional patent on “Fibre-reinforced Composite Product with Flexible Longitudinal Geometry”.

• **Assoc Prof Adrian Yap**
  Awarded the International Association for Dental Research (South-East Asian Division) Charles T. Kean Memorial Award for her research project "A Critical Bending Moment of Implant Component Screw Joint Interface" for sponsorship of travel to the 17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, September 2002, Hong Kong.

• **Assoc Prof Adrian Yap**
  Associate Editor, Journal of Dentistry
  Editorial Board, Operative Dentistry

• **Assoc Prof Jennifer Neo**
  Editorial Board, Operative Dentistry
  Editorial Board, Asian Journal of Aesthetic Dentistry

• **Assoc Prof Grace Ong**
  Editorial Board, European Journal of Dental Education

• **Dr Varawan Sae-Lim**
  Editorial Board, Journal of Dental Traumatology

• **Assoc Prof Adrian Yap**
  Associate Editor, Journal of Dentistry
  Editorial Board, Operative Dentistry
Research Collaborations

Academic Year 2002 - 2003

Collaborations with other Universities

<table>
<thead>
<tr>
<th>S/N</th>
<th>International/ASEAN/Local</th>
<th>Name of Agency, Board etc</th>
<th>Country</th>
<th>Collaborating Dept in Faculty</th>
<th>No of Collaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>International</td>
<td>University of Copenhagen</td>
<td>Denmark</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>International</td>
<td>University of Iowa</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>International</td>
<td>Gothenburg University</td>
<td>Sweden</td>
<td>Restorative Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Local</td>
<td>Nanyang Technological</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Local</td>
<td>University of Washington</td>
<td>USA</td>
<td>Restorative Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>International</td>
<td>University of Heung Kong</td>
<td>China</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>International</td>
<td>Singapore Institute of</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Regional</td>
<td>Dentsply Asia</td>
<td>Hong Kong</td>
<td>Restorative Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Regional</td>
<td>Indo-dent Singapore Pte Ltd</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>International</td>
<td>White Mineral Trioxide</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>International</td>
<td>Institute of Bioengineering and Nanotechnology</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Local</td>
<td>Genome Institute of</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Local</td>
<td>National Dental Center</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>International</td>
<td>Stanford-NASA Biocomputing Centre</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>International</td>
<td>National Centre for Science of Research in Craniofacial (CNR)</td>
<td>France</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL 10

Collaborations with Industry

<table>
<thead>
<tr>
<th>S/N</th>
<th>International/ASEAN/Local</th>
<th>Name of Company/Organisation</th>
<th>Country</th>
<th>Collaborating Dept in Faculty</th>
<th>No of Collaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regional</td>
<td>Singapore Institute of Dental Pulp Therapy</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>International</td>
<td>Dentsply Asia</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Regional</td>
<td>Indo-dent Singapore Pte Ltd</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Regional</td>
<td>White Mineral Trioxide</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Regional</td>
<td>Genome Institute of Singapore</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Local</td>
<td>National Dental Center</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>International</td>
<td>Stanford-NASA Biocomputing Centre</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>International</td>
<td>National Centre for Science of Research in Craniofacial (CNR)</td>
<td>France</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL 4

Collaborations with Research Institutions

<table>
<thead>
<tr>
<th>S/N</th>
<th>International/ASEAN/Local</th>
<th>Name of Research Institution</th>
<th>Country</th>
<th>Collaborating Dept in Faculty</th>
<th>No of Collaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>International</td>
<td>Engineering Research Institute</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Local</td>
<td>Nuclear Microscopy Research Centre</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>International</td>
<td>Institute of Biotechnology and Nanotechnology</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Local</td>
<td>Genome Institute of Singapore</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Local</td>
<td>National Dental Centre</td>
<td>USA</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>International</td>
<td>Stanford-NASA Biocomputing Centre</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>International</td>
<td>National Centre for Science of Research in Craniofacial (CNR)</td>
<td>France</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL 9

Collaborations with Government Agencies, Statutory Boards, etc.

<table>
<thead>
<tr>
<th>S/N</th>
<th>International/ASEAN/Local</th>
<th>Name of Agency, Board etc</th>
<th>Country</th>
<th>Collaborating Dept in Faculty</th>
<th>No of Collaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>International</td>
<td>National Institute of Health</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Local</td>
<td>Health Promotion Board</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Local</td>
<td>Ministry of Health</td>
<td>Singapore</td>
<td>Preventive Dentistry</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL 4

Research Grants Awarded

Financial Year 2002 - 2003

New Research Projects approved by Faculty Research Committee

Noise Reduction of High-speed Turbine Handpiece
Principal Investigator: Prof Chew Chong Lin
Amount: $17,000

The one great fear of dental patients is the high-pitched noise emitted by the high-speed turbine handpiece. In addition, the dentist himself will suffer some hearing loss due to long time exposure and also because his ears are near to the handpiece. Any remedial action taken to reduce the noise will be welcomed both by the patients as well as dentist.

It is with this demand in mind that a team with the combined expertise covering dentistry, acoustics and control is motivated to undertake this project. We will conduct an in-depth analysis of the real characteristics of the handpiece, identifying the noise sources, implementing appropriate noise control measures with appropriate puden design to reduce the noise generated by the handpiece.

Physical Characterisation of White and Development MTA
Principal Investigator: Dr Chng Hui Kheng
Amount: $34,541

While mineral trioxide aggregate (White MTA) is a new material that is recently developed for use in endodontics, its physical and mechanical properties have not been sufficiently characterized yet. White MTA may supersede ProRoot MTA as the endodontic root-end and perforation repair material of choice if the bio compatibility and superior seal provided by ProRoot MTA is retained. This project consists of 3 parts. The aim of the first part is to compare the sealing ability of White MTA, ProRoot MTA and Super EBA when used as a root-end filling material. The second part will compare the pH, solubility, setting time and compressive strength of the same materials. The last part of this project aims to develop a new material which has better handling characteristics than White MTA.

Microleakage of Class II Laminated Glass Ionomer: Effect of Surface Treatment and pH Cycling
Principal Investigator: Dr Phuan Wai Hian
Amount: $61,500

Despite the improvement of composite resin and bonding systems, direct Class II composite resin restorations show considerable leakage especially when margins are located in dentin. Several techniques have been introduced to counter the drawbacks and microleakage problems in gingival margins of Class II cavities. The sandwich technique where glass ionomers are placed on the gingival marginal portion of the cavity and then laminated with composite resin is one of the techniques proposed. Based on our laboratory investigations seem to show a promising result, the early clinical results have shown high failure rates. The main reasons for failure were loss of glass ionomer cement or fracture of restorations.

Several approaches have been made to improve mechanical and physical properties of glass ionomer cements. These include the addition of micro填料, polyacrylic acid and resin, the addition of a high viscosity glass ionomer (eg Fuji IX, Ketac-Molar) to the market. The physical and mechanical properties of these cements have been shown to be better than conventional glass ionomers. A variety of materials and different techniques have been introduced to restorations with wide success.

Measurement of the lesion depth in the treated window will determine the preventive effect of the laser treatment. The result of this study may help develop a new preventive therapy for dental erosion.

Laser-induced Fluoride Uptake in Enamel and Root
Principal Investigator: Dr. Ang Hwee Ping
Amount: $55,000

Dental caries was recently reported by the US surgeon general to be the most common chronic childhood disease. Root caries, the most common cause of irreversible loss of dental hard tissue due to acid attack, may help develop a new preventive therapy for dental erosion. The one great fear of dental patients is the high pitched noise emitted by the high-speed turbine handpiece. In addition, the dentist himself will suffer some hearing loss due to long time exposure and also because his ears are near to the handpiece. Any remedial action taken to reduce the noise will be welcomed both by the patients as well as dentist.

It is with this demand in mind that a team with the combined expertise covering dentistry, acoustics and control is motivated to undertake this project. We will conduct an in-depth analysis of the real characteristics of the handpiece, identifying the noise sources, implementing appropriate noise control measures with appropriate puden design to reduce the noise generated by the handpiece.

Physical Characterisation of White and Development MTA
Principal Investigator: Dr Chng Hui Kheng
Amount: $34,541

Many studies have looked at the physical and mechanical properties, and clinical characteristics of ProRoot MTA. These studies have shown to have better sealing ability when used as a root-end filling when compared to traditional materials. ProRoot MTA was also found to be less toxic and was the only material studied that allowed cementum over growth when used as a root-end filling material. Direct pulp caps with the combined expertise covering dentistry, acoustics, pneumatic and control engineering will be welcomed both by the patients as well as dentist.

It is with this demand in mind that a team with the combined expertise covering dentistry, acoustics and control is motivated to undertake this project. We will conduct an in-depth analysis of the real characteristics of the handpiece, identifying the noise sources, implementing appropriate noise control measures with appropriate puden design to reduce the noise generated by the handpiece.

Physical Characterisation of White and Development MTA
Principal Investigator: Dr Chng Hui Kheng
Amount: $34,541

White MTA is retrieved from the commercial market. The physical and mechanical properties of these cements have been shown to be better than conventional glass ionomers. A variety of materials and different techniques have been introduced to restorations with wide success.

Several approaches have been made to improve mechanical and physical properties of glass ionomer cements. These include the addition of micro-fillers, polyacrylic acid and resin, the addition of a high viscosity glass ionomer (eg Fuji IX, Ketac-Molar) to the market. The physical and mechanical properties of these cements have been shown to be better than conventional glass ionomers. A variety of materials and different techniques have been introduced to restorations with wide success.

Several approaches have been made to improve mechanical and physical properties of glass ionomer cements. These include the addition of micro-fillers, polyacrylic acid and resin, the addition of a high viscosity glass ionomer (eg Fuji IX, Ketac-Molar) to the market. The physical and mechanical properties of these cements have been shown to be better than conventional glass ionomers. A variety of materials and different techniques have been introduced to restorations with wide success.
Dental avulsion represents the more severe form of dental injuries normally inflicting extensive damages to the pulp and the periodontium (PDL). While necrotic pulp resulting from severance of pulpal apical neurovasculature, if not revascularised (Kling et al 1986), could be dealt with by optimal timely root canal therapy (Trope et al 1995), it is the presence of the vital PDL that is crucial for establishing and maintaining a stable tooth / bone interface. Substantial investigations have attempted to inhibit the sequelae of root resorption associated with the damaged periodontium and to regenerate the functional periodontium after replantation (Trope 2002). However, these therapeutic strategies have not been able to provide breakthrough predictable success and these modalities were mainly focused on the functional healing potential of the periodontal tissue on the root surface of avulsed teeth (Dental Traumatology 2001). The alveolar socket has been speculated to play a role in the healing of replanted teeth (Trope & Friedman 1992). Recent evidences have also implicated the roles of growth factors or proteins such as PDGF, IGF, bFGF, VEGF and OSAD would be representative of different stages of healing. Amount: $90,000

New Research Project approved by University Research Committee

Production of Bone Cells (Osteogenic Differentiation) from Human Embryonic Stem Cells - Potential for Transplantation Therapy and Drug/ Biomaterial Screening

Principal Investigator: Dr Cao Tong
Amount: $671,000

Despite recent advances in transplantation sciences, there is a shortage of donor organs that makes it unlikely that the growing demand for lifesaving organ replacements will be fully met through organ donation strategies. The use of stem cells to generate replacement tissues for repairing bone defects is a major focus of research. Another future use of human stem cells and their derivatives include the testing of candidate therapeutic drugs and biomaterials. Although animal model testing is a mainstay of current drug/biomaterial screening, it cannot always predict the effects that a developmental drug/biomaterial may have on human cells. Stem cells will likely be used to develop specialised cells to evaluate drug/biomaterial detoxifying capabilities and represent a new type of early warning system to prevent adverse reactions in patients (HHS). This research is to stimulate and direct the differentiation of human ES cells toward osteogenic cell lineages. The osteogenic cell lineages from human ES cells would be an ideal unlimited source of human cells for many purposes such as (1) the study of development and gene control of human osteogenic cell lineages, osteogenesis, bone regeneration, remodeling and reconstruction; (2) gene/protein delivery therapy to cure bone diseases; (3) cell-injection therapy for bone repair; (4) cell transplanting based bone reconstruction including bone tissue engineering; and (5) the development of cytotoxicity/genotoxicity screening tests for bone related biomaterials and drugs; etc. Nonetheless, to date no osteogenic cell lineage from human ES cells is developed (Web of Science and PubMed database). Thus, this study is to compete in the world-wide cutting-edge ESCell research field.

Amount: $799,450

New Research Project approved by Biomedical Research Council

Innovative Non-invasive Laser Treatment for Prevention of Enamel Demineralisation (Tooth Decays)

Principal Investigator: Assoc Prof Stephen Hsu Chin Ying
Amount: $799,450

Despite the significant decline of caries rate in the last few decades in the developed countries, dental caries is still reported to be the single most common chronic childhood disease (Report of US Surgeon General, 2000). In Asia, more than 80% caries rate has been reported in many epidemiological studies (Stephen, 1993). Since 1960s, accumulated evidence has clearly demonstrated the laser-induced caries prevention (LICP) in enamel. However, many clinicians are still concerned about a potential pulpal damage caused by the high-energy laser irradiation used in melting and/or sealing the enamel as advocated by the highly regarded “enamel melting hypothesis” in the last few decades. By avoiding enamel melting, a multidisciplinary research team has recently succeeded in using low energy laser to provide significant caries prevention in enamel and quantified two major mechanisms, “crystal purification” and “organic blocking”, in UCP (Hsu et al., 2000). Although this breakthrough may precipitate the clinical development of UCP, the laser parameters capable of maximising these two mechanisms remain unknown. The purpose of this study is to comprehensively characterise the laser-enamel interaction and subsequently identify the optimal laser parameters for UCP. The program will first qualitatively and quantitatively characterise the physicochemical properties of heated enamel at consecutive temperature ranges. The second step is to build a computational model to simulate the four dimensional profiles of laser-induced heat flow and temperature rise in enamel. Both CO2 and Er:YtAG lasers will be used to investigate the overall benefit-damage ratio from the correlated optical-thermal-mechanical-chemical-crystallographic perspectives. The simulation model will be systemically validated and refined based on these experimental data and subsequently used to select the optimal range of laser parameters to maximise the UCP. As a result, this study may pave the road for the development of an innovative non-invasive laser device for caries prevention.
Refereed Publications

Calendar Year 2002

Premium

Chay, S and A B M Rabie

Tan, K BC and J I Nicholls

Chng, H K, J EA Palamara and H H Messer

Yap, A U J, S H Teoh and C L Chew

Yap, A U J, M S Soh and K S Siow

Yap, A U J, Y S Pek, R A Kumar, P Cheang and A K Khoh

Yap, A U J, K E C Wee and S H Teoh

Yap, A U J, M S Soh and K S Siow

Yap, A U J and P Wattanapayungkul

Wattanapayungkul, P and A U J Yap

Yap, A U J, S B Ong, W S Tan, W Y Yap and J C Yeo

Yap, A U J, S B Ong, W S Tan, W Y Yap and J C Yeo

Tan, K S, K P Song and G H L Ong

Huang, Z M, R Gopal, K Fujihara, S Ramakrishna, P L Loh, K W C Foong, V K Ganesh and C L Chew
Refereed Publications

Calendar Year 2002

Premium

Yap, A U J, S P Chandra, S M Chung and C T Lim
Changes in Flexural Properties of Composite Restorative After Aging in Water.

Yap, A U J, K B C Tan, E K Chua and H H Tan
Depression and Somatisation in Patients with Temporomandibular Disorders.

Yap, A U J, S Y Tham, L Y Zhu and H K Lee
Short-term Fluoride Release from Various Esthetic Restorative Materials.

Leading

Mohamed Tahir

Reher, P, M Harris, M L Whiteman, K H Ho and S Meghji
Ultrasound Stimulates Nitric Oxide and Prostaglandin E2 Production by Human Osteoblasts.

Ong, K S and H S Loh
Entrapment of the Inferior Dental Nerve by a 3-Rooted Mandibular Third Molar.

Loew, E L, R K K Ow, S Valiyaveettil, M H Lee and R W H Pho
Colourfast Pigments in Silicone Hand and Maxillofacial Prostheses.

Chou, A, V Sae-Lim, TM Lim, J T Schantz, SH Teoh, C L Chew and D Hutmacher
Culturing and Characterisation of Human Periodontal Ligament Fibroblasts - A Preliminary Study.

Yap, A U J, E K Chua and J K E Hoe
Clinical TMD, Pain-related Disability and Psychological Status of TMD Patients.

Yap, A U J, Y S Pek and P Cheang

Zhu, L Y, S Y Tham, A U J Yap and H K Lee
Field-amplified Stacking Injection-Capillary Electrophoresis for Quantitative Analysis of Fluoride Released from Dental Composites.

Others

Yeo, J F
Does Nitric Oxide Play a Role in Orofacial Pain Transmission?

Cao, T, T Shiota, K Ohno and K Michi
Trabecular Bone Loss in Ovariectomised Rabbit Mandibles.

Ong, K S and S B Keng
The Role of Cosmetic Dentistry in Facial Rejuvenation.
Cao T

Cao T, Shi Zheng, Hua Liu, H W Ouyang, S H Teoh and W Mikael
Osteogenic and Chondrogenic Lineage Differentiation of Mesenchymal Stem Cells in a Novol 3D Culture with a Novel Scaffold. 81st General Session and Exhibition of International Association for Dental Research (IADR), 25th - 28th June 2003, Göteborg, Sweden.

Chay S H, P Wattanapayungkul, A U J Yap, P Loh and S M Chung
Comparison of Shear- peel Bond Strength of Orthodontic Brackets to Various Ceramic Systems. 17th International Association for Dental Research (South-East Asia Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Chay, S H, A U J Yap, S L Wong and N Mohd
Effects of Surface Treatment and Aging on the Bond Strength of Orthodontic Brackets to Provisional Materials. 79th Congress of the European Orthodontic Society, 10th - 14th June 2003, Prague, Czech Republic.

Chew C L

Chew C L

Chew C L

Chew C L
All-Ceramic Restorations. 5th FDI-Indian Dental Association Scientific Meeting, 7th - 8th December 2002, Goa, India.

Chou A, V Sae-Lim, Y F Zhou, J T Schantz, D W Hutmacher and T M Lim
Preliminary Studies on Human Periodontal Ligament Fibroblasts and Alveolar Osteoblasts Cultured on Scaffold Constructs. 1st NHG Annual Scientific Congress, 17th - 18th August 2002, Singapore. (Abstract Poster D018 (Pg 144) and 7th National University Hospital-National University Singapore (NUH-NUS) Annual Scientific Meeting, 16th - 17th August 2002, Singapore.

Chng H K, A U J Yap, P Wattanapayungkul and C P C Sim

Chng H K
Update on Materials Used in Intracoronal Bleaching. 16th College Convocation, Royal Australasian College of Dental Surgeons, 17th - 20th October 2002, Melbourne, Australia.

Chooi K W, M F Lee, R S Selamat, R D Zhou, P Wattanapayungkul and A U J Yap
Effect of Home Bleaching on Surface Hardness of Composite Restorative Materials. 6th NUS-NHU Annual Scientific Meeting, 16th - 17th August 2002, Singapore.

Chung S M, A U J Yap, S P Chang and C T Lim

De Hoyos E G, A U J Yap and C S Hsu
In Vitro Caries Inhibition by Fluoride Releasing Tooth-colored Restoratives. 17th International Association for Dental Research (South-East Asia Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Deng B, K B C Tan and G R Liu

Deng Y and C S Hsu
Porosity Change in Heated Enamel. 6th NUS-NHU Annual Scientific Meeting, 16th - 17th August 2002, Singapore.

Foong K W C and W W Tok
A Multimedia e-learning Package on Basic Lateral Cephalometry. 13th South-East Asia Association for Dental Education Annual Meeting, 17th - 20th September 2002, Hong Kong. (Abstract SP-3).

Foong K W C, B H Bay, G W C Yip, C C Ling, K S Tan and A C Y Lim
Expression of Nitric Oxide Synthase in Palatal Wound Healing. 17th International Association for Dental Research (South-East Asia Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract IO-6).

Foong K W C, S H Ong and T Kondo

Gao X Land C S Hsu
Synergistic Effects of Fluoride and CO₂ Laser on Root Demineralisation. 17th International Association for Dental Research (South-East Asia Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract IP-119).

Geng J P, K B C Tan, G R Liu and Q S Ma
Model-based Guidelines for Dental Implant Design Optimisation. 2nd Japan China Medical Conference, November 2002, Beijing, China.

Ho Mary, L K Ti, K S Tan, K H Ho and T L Lee

Ho H, J C L Neo, K B C Tan and F Moen
Conference Papers AY 2002 - 2003

Ho H, J C L Neo and F Moen
Load Fatigue Performance of Full-coverage Ceromer Crowns.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Hsu C S, L Gao and James Wefel
Effects of Co2 Laser on Fluoride Uptake in Enamel.

Hsu C S, J S Wefel
56th American Academy of Pediatric Dentistry Annual Meeting, 22nd - 26th May 2003, New York, United States.

Hsu C S, J C Chen, S C Shih and F J Kao
Microspectroscopy and Laser Scanning Microscopy of Tooth Sections with One and Two-Photon Excitation.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Hua Liu, T Cao, Saw T Y and H W Ouyang
Allogeneic Immunogenicity of Mesenchymal Stem Cell and its Differentiated Osteogenic Lineage.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Keng S B, P L Loh and ZeHe Wu
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Kruger A, C Eilerstrom, K S Tan, J F Yeo and TWurtz
The Haematopoietic Progenitor Protein RP59 and its Expression in Angiogenic Processes.
11th Biennial Meeting of the International Association of Oral Pathologists (IAOP) and International Congress on Oral Pathology and Medicine (ICOMP), 5th - 8th August 2002, Singapore.

Lam K and V Sue-Lim
The Effect of Endogain on Periodontal Healing of Replanted Monkeys’ Teeth. 6th NUS-NHU Annual Scientific Meeting and 1st NHG Annual Scientific Congress, 16th - 18th August 2002, Singapore.

Leow, E L, R K K Ow, S Valleyaettli, M H Lee and R W H Pho
Colorfast Pigments in Silicone Hand and Maxillofacial Prostheses.

Lim A, B H Bay, K W C Foong, K S Tan, G W C Yip and C C Ling
Expression of Vascular Endothelial Growth Factor in Palatal Wound Healing.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract IP-50).

Lim A, C C Ling, B H Bay, K S Tan, G W C Yip and K W C Foong
VEGF and INOS - A Potent Combination for Ideal Palatal Wound Healing.

Lim J, S H Chay and Cao T
Regeneration of Bone with VEGF and VICRYL Mesh Scaffold.
79th Congress of the European Orthodontic Society, 10th - 14th June 2003, Prague, Czech Republic.

Lim LP
14-year Follow-up of a Workplace Periodontal Health Programme.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Lim TY, Y W Wu, A U J Yap and P Cheang
Development of Spherical Glass Ionomer Cements.
2nd College of Engineering (CoE) Technology Week, 4th - 8th March 2003, Singapore.

Lo TS, S H Chay and T Cao
Bone Regeneration using VEGF with a Poly-E-Caprolactone Scaffold and Fibrin Glue.
79th Congress of the European Orthodontic Society, 10th - 14th June 2003, Prague, Czech Republic.

Loh H S
Current Surgical and Therapeutic Uses and Future Prospects of Lasers in Oral and Maxillofacial Surgery.

Loh H S

Loh H S
Overview of Laser Applications In Oral and Maxillofacial Surgery.

Loh P L, M K S Mah, C P W Lye and A U J Yap
Influence of Dietary Simulating Solvents on Hardness of Provisional Materials.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Mok B Y Y, H K Chng, P Wattanapayungkul, A U J Yap and G H L Long
Dental Diagnostic Clinics in the Dental School Curriculum.
13th South-East Asian Association for Dental Education Annual Meeting, 18th September 2002, Hong Kong.

Mok B Y Y and A U J Yap
Effects of Topical Fluoride on Surface Roughness of Tooth-colored Restoratives.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract IP-112).

Neo J C L, Chew C L and A U J Yap
5-year Clinical Study of Copy-milled Ceramic Inlays.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.
Conference Papers AY 2002 - 2003

Ng C H and J F Yeo
The Role of the Internet and PDA in Oral & Maxillofacial Pathology.
11th Biennial Meeting of IAOPI and ICOPM, 5th - 8th August 2002, Singapore.

Ng V A C, D S Q Koh, B Y Y Mok, S Choo and L P Lim
Salivary Biomarkers Associated with Academic Examination.

Ong G H L
The Emerging Connection Between Oral Infection and Systemic Disease.

Ong S H and K W C Foong
3-D Imaging for Orthodontic Applications.
In Proc. 2nd French - Singapore Biomedical Engineering Symposium, 10th - 13th June 2002, Lyon, France.

Ong S H, K W C Foong and Ashraf A Kassim
Visualisation and Analysis of 3D Dental Images.
2nd International Symposium of Biomedical Engineering and Technology, 14th - 18th October 2002, Yung-Kang City, Taiwan.

P Wattanapayungkul, A U J Yap and S M Chung
Influence of Curing Lights on Composite Resistance to Chemical Degradation by Food-simulating Liquids.

Rong-Yan, S M Chung, F L Yap and A U J Yap
NUS Graduate Programme in Bioengineering, 1st Student Academic Conference, 30th December 2002, Singapore.

Sae-Lim V
The Effect of Intracanal Ledemix on Root Resorption of Delayed-replanted Monkeys' Teeth.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Sae-Lim V, W Y Ong, Z M Li, K Lam, M M Khiin, K S Wong and J C L Neo
The Effect of Basic Fibroblast Growth Factor on Delayed-replanted Monkeys' Teeth.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Saw TY, T Cao, A U J Yap, M L Ng and Hua Liu
Odontoblasts and Pulp Fibroblasts in Dental Organ Culture for Biocomposite Cytotoxicity Testing.
6th NUS-NHU Annual Scientific Meeting, 16th - 17th August 2002, Singapore.

Saw TY, T Cao, A U J Yap and M L Ng
Tooth Slice Organ Culture for Dental Biomaterials Cytotoxicity Testing.
2nd International Congress on Biological and Medical Engineering, 5th Asia Pacific Conference on Medical and Biological Engineering and 11th International Conference on Biomedical Engineering, 4th - 7th December 2002, Singapore.

Soh M S and A U J Yap
Biocomposite Cytotoxicity to Odontoblasts and Pulp Fibroblasts in Organ Culture.
2nd International Congress on Biological and Medical Engineering, 5th Asia Pacific Conference on Medical and Biological Engineering and 11th International Conference on Biomedical Engineering, 4th - 7th December 2002, Singapore.

Soh J, M T Chew and H B Wong
Professional Assessment of Chinese Facial Profile Aesthetics.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Singh B, K S Tan, J Y Y Tay and J F Yeo
11th Biennial Meeting of the International Association of Oral Pathologists (IAOP) and International Congress on Oral Pathology and Medicine (ICOPM), 5th - 8th August 2002, Singapore.

Sethu S, P Wattanapayungkul and P L Loh
Colour Stability of Core Materials Used in Dental Restorations: A Spectrophotometric Study.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Sethu S, P Wattanapayungkul and P L Loh
Ability of Composite Core Materials to Mask the Color of Pre-fabricated Posts Under All-ceramic Crowns.

Soh J and M T Chew
Comparative Assessment of Facial Aesthetics by Professionals, Dental Students and Laypersons.
American Dental Association of Orthodontists 103rd Annual Meeting, 2nd - 6th May 2003, Hawaii, United States.

Soh M S and A U J Yap
Thermal Emission by Different Light-curing Units.

Soh M S and A U J Yap
Effectiveness of Composite Cure Accelerators with Different Light-curing Units.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.
Soh M S and A U J Yap
Post-gel Polymerisation Shrinkage of “low-shrinkage” Composite Resins.

Tan K B C
The RDP in the IADR (SEA Division).
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Tan K B C and S B Keng
NUS Experience - Building and Using Electronic Resources for Teaching Dentistry.
Universitas 21 (U21) Annual Meeting of Medical, Dental Nursing and Rehabilitation Sciences, 31st October - 1st November 2002, Hong Kong.

Tan B F, K B C Tan and J I Nicholls
Critical Bending Moment of Implant Fixture-abutment Screw Joint Interfaces: Effect of Torque Levels and Implant Diameter.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong.

Tan K S, P Y Boey, S H Lim, R Y Paul, K M Win and J J Yeo
The Patchy Tale Hedgehog in Odontogenic Pathology.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract published in Journal of Dental Research Vol 81).

Tan J Y Y, K S Tan, A Wee and J F Yeo
The Sonic Hedgehog Signaling Pathway in Oral Squamous Cell Carcinomas - Preliminary Findings.
11th Biennial Meeting of the International Association of Oral Pathologists (IAOP) and International Congress on Oral Pathology and Medicine (ICOPM), 5th - 8th August 2002, Singapore.

Teo C S
Role of the IFDEA in Global Dental Education.
13th South-East Asia Association for Dental Education Annual Meeting, 18th - 20th September 2002, Hong Kong. (Abstract SG-2).

Tng C H, C W Lian, J J Jing, K S Tan, S B Keng and K W C Foong
Nasal Width and Naso-labial Angles as Biometrics for Anterior Teeth Set-up.
17th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 18th - 20th September 2002, Hong Kong. (Abstract IP-114).

Toh TK, H S Wong, K S Mah, P W Lye, A U J Yap and P L Loh
Influence of Dietary Simulating Solvents of Surface Roughness of Provisional Materials.
4th National Dental Centre Annual Scientific Meeting, 9th November 2002, Singapore.

Veerappan Girija and C S Hsu
Correlated Investigation of Lased Enamel by Using PLM, CLSM and ESEM.

Wong K S and V Sae-Lim
The Effect of Intracanal Ledermix on Root Resorption of Delayed-replanted Monkeys’ Teeth.

Wong V, K W C Foong, T Kondo and S H Ong
3D Image Analysis and Visualisation of a Human Mandible for Assessment of Asymmetry.

Xiao G, S H Ong and K W C Foong

Yang M, S H Ong and K W C Foong
A Three-dimensional Cephalometric System for Locating Craniofacial Landmarks.
Yap A U J
Management of Temporomandibular Disorders.

Yap A U J
Temporomandibular Disorders - The Biopsychosocial Model.

Yap S H, A U J Yap, C K Teo, C M Tay, K L Ng and H P Y Thean
Microwave of Drying of High Strength Dental Stone.
4th National Dental Centre Annual Scientific Meeting, 9th November 2002, Singapore.

Yap F L, S M Chung, Rong-Yan and A U J Yap
Development of Micro-indentation Techniques for Characterisation of Dental Bicomposites.
NUS Graduate Programme in Bioengineering, 1st Student Academic Conference, 30th December 2002, Singapore.

Yap A U J
Understanding and Enjoying Research.
South Zone Science and Technology Centre STA (Science Training and Research) Symposium 2003, 8th January 2003, Singapore.

Yap A U J, PBL and EBM Synergy
The Future Approach to Teaching the Practice of Dentistry?
1st Asia-Pacific Evidence-Based Medicine Workshop and Conference, 22nd - 25th January 2003, Singapore.

Yap A U J
TMD for the General Dental Practitioner.

Yap A U J
An Introduction to TMD: The Biopsychosocial Approach.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap A U J
Diagnostic Criteria and Clinical Examination for TMD.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap A U J
Management of TMD.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap A U J, E K Chua and K B C Tan
Depression and Somatisation: Influence on Self-report of Pain and Disability.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden. (Abstract No. 1869) published in Journal of Dental Research, 82, Special Issue B (June 2003): 244.

Yap A U J, K B C Tan and E K Chua
Association Between Depression and Somatisation in TMD Patients.

Yiu C K Y, F R Tay, N M King, D H Pashley, S K Sidhu, J C L Neo, M Toledano and A Wong
Interaction of Conventional Glass-ionomer Cements with Hydrated Dentin.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Yeo J F
Cannabinoid Receptor Expression in Rat Brainstem After Facial Carrageenan Injections.

Zhou Y, A Chou, V Sae-Lim, D W Hutmacher and T M Lim
Expression on mRNA Encoding for Hard Tissue Associate Proteins in Periodontal Ligament and Gingival Fibroblasts.
1st NHG Annual Scientific Congress, 16th - 18th August 2002, Singapore.
Graduate Students Research Projects AY 2002-2003

Graduate Residents in MDS Programmes

Endodontics

Year 3
Dr Low Meng Tze, Kenneth
Comparison of Mean Centering Ability of 3 Instrumentation Techniques
Supervised by
Dr Patrick Tseng
Prof Jack Nicholls
Dr Lui Jeen Nee
Antimicrobial Activity of Chlorhexidine Associated with Different Vehicles with Enterococcus Faecalis
Supervised by
Dr Varawan Sae-Lim
Dr Song Kean Peng
Dr Chen Nah Nah

Year 2
Dr Goh Kwee Chien, Benny
PDGF Expression in the Extraction Sockets
Supervised by
Dr Varawan Sae-Lim

Dr Maria Cristina F Morales
The Expressions of IGF in Sockets of Avulsed Teeth
Supervised by
Dr Varawan Sae-Lim

Year 1
Dr Ang Ee Choon, Richard
Semi-quantitative Analysis of VEGF Expression in Immediate and Delayed Replanted Teeth
Supervised by
Dr Varawan Sae-Lim

Dr Kuah Hong Guan
The Effects of Chelating Agents on Smear Layer Removal With and Without Ultrasonics at the Apical 1/3 of the Root Canal: A SEM Study
Supervised by
Dr Patrick Tseng

Prosthodontics

Year 3
Dr Lee Chee Wee
Comparison of Mean Centering Ability of 3 Instrumentation Techniques
Supervised by
Dr Varawan Sae-Lim

Dr Ng Hsu Ching, Lynette
Fatigue Loading of Selected Post and Core Systems
Supervised by
Prof Chew Chong Lin

Dr Quek Eng Yew, Christopher
Load Fatigue Performance of Narrow, Regular and Wide Platform Implants
Supervised by
Assoc Prof Keson Tan

Year 2
Dr Lee Kong Fei, Frank
Critical Bending Moment of Four Fixture-Abutment Interface Designs
Supervised by
Assoc Prof Keson Tan
Prof Jack Nicholls

Dr Quek Heng Chuan
Load Fatigue Performance of Four Fixture-Abutments Interface Designs
Supervised by
Assoc Prof Keson Tan
Prof Jack Nicholls

Year 1
Dr Leong Woei Jian, Elvin
The Effect of Tooth Preparation Height and Taper on the Resistance Form
Supervised by
Assoc Prof Keson Tan
Dr Chua Ee Kiam
Dr Wong Keng Mun

Prosthodontics

Oral and Maxillofacial Surgery

Year 3
Dr Lye Kok Weng
A Prospective Study on Wound Healing Following Extractions in Irradiated Jaws
Supervised by
Dr Poon Choy Yoke

Dr Tay Yen Yee, Juliet
Identification of RANKL in Bone-resorbing Cysts and Tumours of the Facial Skeleton
Supervised by
Assoc Prof Yeo Jin Fei
Prof Malcolm Harris

Dr Wong Chung Wen, Raymond
Quantification of Angiogenic Factors in Human Platelet Rich Plasma
Supervised by
Assoc Prof Ho Kee Hai
Prof Malcolm Harris

Year 2
Dr Hur Wei Tieng
Patched Mutation Detection in Archival Paraffin Embedded Specimens
Supervised by
Dr Winston Tan
Graduate Residents in MDS Programmes

**Orthodontics**

**Year 3**

**Dr Lim Chong Yang, Arthur**

VEGF Expression Following Palatal Wound Healing in a Rabbit Model After Simulated Cleft Palate Surgery

Supervised by

**Assoc Prof Kelvin Foong**

**Dr Teh Y Mui, Marina**

The Relationship Between Dental and Facial Tissue Changes Following Bimaxillary Jaw Surgery in Class II Patients

Supervised by

**Dr Mimi Yow**

**Dr Ling Chem Chem**

Nitric Oxide Synthase Expression Following Palatal Wound Healing in a Rabbit Model After Simulated Cleft Palate Surgery

Supervised by

**Assoc Prof Kelvin Foong**

**Year 2**

**Dr Lo Tong Soon**

Bone Regeneration Using VEGF with PCL as Scaffold

Supervised by

**Dr Chay Siew Han**

**Dr Wong Vic-Pearly**

3D Assessment of Mandibular Asymmetry

Supervised by

**Assoc Prof Kelvin Foong**

**Dr Salikin Zulfikri**

Craniofacial Landmark Identification in 3D Cephalometry and Computed Tomography

Supervised by

**Assoc Prof Kelvin Foong**

**Dr Lim Janee**

Bone Regeneration Using VEGF with VIC RYL as Scaffold

Supervised by

**Dr Chay Siew Han**

**Year 1**

**Dr Tan Mei Yee**

3D Assessment of Facial Expression (Posed Smile) in Patients With and Without Clefts of the Lip

Supervised by

**Dr Kaan Sheung Kin**

**Assoc Prof Kelvin Foong**

**Dr Poon Kee Hoon**

Evaluate the Effectiveness of Mandibular Advancement Device in Chinese Patients with Mild to Moderate Obstructive Sleep Apnoea

Supervised by

**Dr Chay Siew Han**

**Dr Mok Tong Bee**

A Cephalometric Study of Cranial Bases in Chinese Adults

Supervised by

**Dr Mimi Yow**

**Periodontics**

**Year 1**

**Dr Khurram Ataullah**

To Compare the Effects of Oral Hygiene, Non-surgical Periodontal Therapy and Control, on Periodontal Status and Systemic Health as Measured by Level of Inflammatory Mediators (PGE2, IL-1β, TNF-α) in Saliva, Periodontal Parameters, and Blood C-reactive Protein Level, in a Randomised Control Trial Conducted on Singaporean Diabetics aged 25-65 years, over a Period of 9 Months

Supervised by

**Assoc Prof Lim Lum Peng**

**Dr Tan Wah Ching**

The Effect of Periodontal Therapy on Diabetics Control

Supervised by

**Assoc Prof Lim Lum Peng**
## Graduate Students Research Projects AY 2002 - 2003

### PhD and MSc Candidates

#### PhD

- **Assoc Prof Kelvin Foong**
  Early Palatal Shape Changes in Complete Unilateral Cleft Lip and Palate Following Primary Lip Surgery
  Supervised by Prof Andrew Sandham

- **Dr Hla Myint Htoon**
  Oral Health Promotion Programme for Diabetics in Singapore
  Supervised by Assoc Prof Lim Lum Peng

- **Mr Chung Sew Meng**
  Development of Micro-mechanics Strategies for Characterisation of Dental Composites
  Supervised by Assoc Prof Adrian Yap

- **Dr Khoo Suan Phaik**
  Racial Differences in Clinical TMD Subtypes, Psychological Distress & Psychosocial Dysfunction in an Urban Malaysian TMD Population
  Supervised by Assoc Prof Adrian Yap

- **Dr Wang Xiaoyan**
  Environmental Effects on the Physico-mechanical Properties of Glass Ionomer Cements
  Supervised by Assoc Prof Adrian Yap

- **Ms Wu Xiaowa**
  Physical Enhancement of Glass Ionomer Cements
  Supervised by Assoc Prof Adrian Yap

- **Dr Li Zhimei**
  Engineering of Dental Structure
  Supervised by Dr Varawan Sae-Lim

- **Dr Veerapann Girija**
  Characterisation of Organic Matrix in Lased Enamel
  Supervised by Assoc Prof Stephen Hsu

- **Dr Deng Ying**
  Laser and Heat Induced Physicochemical Changes in Human Enamel
  "Instead of" Low Energy Laser and Heat Induced Physicochemical Changes in Human Enamel
  Supervised by Assoc Prof Stephen Hsu

- **Dr Gao Xiaoli**
  Synergistic Effect of CO\textsubscript{2} Laser and Fluoride on Root Demineralisation
  Supervised by Assoc Prof Stephen Hsu

- **Dr Zou Xiaohui**
  Palatal Wound Healing and Contraction
  Supervised by Assoc Prof Kelvin Foong

- **Dr Nyi Lay Maung**
  Applications of Laser in Caries Prevention
  Supervised by Assoc Prof Stephen Hsu

- **Dr Li Zhimei**
  Pulp Responses to Acidic Fibroblast Growth Factor in Monkey
  Supervised by Dr Varawan Sae-Lim

- **Dr Edelmira De Hoyos Gonzalez**
  Long-term Caries Inhibitory Effects of Fluoride Releasing Tooth-coloured Restorative Materials
  Supervised by Assoc Prof Adrian Yap

- **Dr Kalaiselvi Kuppusamy**
  Immunohistochemical Analysis of Periodontal Tissue of Extracted Teeth
  Supervised by Dr Varawan Sae-Lim

- **Ms Soh Mui Siong**
  Composite Cure and Post-gel Shrinkage with Different (Halogen and LED) Curing Lights
  Supervised by Prof Loh Hong Sai

#### MSc

- **Dr Faisal Moeen**
  Effect of Varying Height and Taper on the Load Fatigue Performance of Full-crown Ceromer Crowns
  Supervised by Assoc Prof Jennifer Neo

- **Dr Swaminathan Sethu**
  The Influence of Color of Different Post and Core Systems on the All-ceramic Crown Restorations
  Supervised by Dr Loh Poey Ling

- **Dr Deng Bin**
  Finite Element Analysis of Angulated Implant Systems
  Supervised by Assoc Prof Keison Tan

- **Dr Liu Hua**
  Allogenic Immunoreaction of Mesenchymal Stem Cell and its Differentiated Cell in Vitro
  Supervised by Dr Cao Tong

- **Ms Saw Tzuen Yih**
  Tooth/Pulp Culture for Dental Biomaterials Cytotoxicity Testing
  Supervised by Dr Cao Tong

- **Dr Shi Zheng**
  3D Osteogenesis Using Stem Cells and Absorbable Scaffolds
  Supervised by Dr Cao Tong

- **Dr Intekhab Islam**
  Marginal Adaptation of Retrograde Filling Materials
  Supervised by Dr Chng Hui Kheng

- **Dr Meenakshi**
  Neuronal Mechanism of Trigeminal Neuralgia
  Supervised by Prof Loh Hong Sai

- **Assoc Prof Adrian Yap**
  Assoc Prof Slow Kok Siong

- **Assoc Prof Siow Kok Siong**
  Assoc Prof Adrian Yap

- **Assoc Prof Stephen Hsu**
  Assoc Prof Adrian Yap

- **Assoc Prof Lim Lum Peng**
  Assoc Prof Adrian Yap

- **Assoc Prof Kelvin Foong**
  Assoc Prof Adrian Yap

- **Assoc Prof Adrian Yap**
  Assoc Prof Adrian Yap

- **Assoc Prof Stephen Hsu**
  Assoc Prof Adrian Yap

- **Assoc Prof Adrian Yap**
  Assoc Prof Adrian Yap

- **Assoc Prof Adrian Yap**
  Assoc Prof Adrian Yap

- **Assoc Prof Adrian Yap**
  Assoc Prof Adrian Yap